BRUHATH BENGALURU MAHANAGARA PALIKE

Office of the Executive Engineer, Road Infrastructure – East Division.
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No. EE RI-EAST /TEND/ 04. /2023-24 Date: 26-03-2024

Proceedings of the Pre-Bid meeting held on 14.03.2024 under the Chairmanship of Engineer-In-Chief, BBMP regarding "Construction of Elevated Rotary Flyover at IOC Junction and Construction of additional 2Lane ROB at Baiyyappanahalli Railway Level Crossing" on Turnkey - Lumpsum - Fixed Price - No Variation - No Escalation basis.

Reference: 1. Tender Notification No: No. EE/RI/EAST/TEND/04 /2023-24 Dated: 04.03.2024
2. Pre bid meeting held on 14-03-2024.

BBMP officers / Consultants present:

1. Sri.Prahallad B.S., Engineer-In-Chief, BBMP
2. Executive Engineer, Road Infrastructure-East Division.
3. Assistant Executive Engineer, Road Infrastructure-East Division.
4. M/s. NEZ Infratech Pvt. Ltd. - Consultant

Bidders present:

1. M/s. M. Venkata Rao infra Projects Pvt. Ltd.
2. M/s. RNS Infrastructure Limited.
3. M/s. Dinesh Chandra R Agrawal InfraconPvt. Ltd.

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The Chairman (EIC) welcomed all the person present in the meeting and requested EE (RI-East) to present the queries raised by the bidders. EE (RI-East) explained each of the queries and after detailed deliberation, the queries were replied as below:

Sl no	Clause No	Clarification required by the applicants	Reply from BBMP
1	Tender Notification INVITATION FOR TENDER (IFT) – Time Period	The completion period is mentioned: 24 months (including Monsoon) is in sufficient considering the scope of work to be executed in the busy area. It should be at least 36 months.	Tender condition Prevails

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Sl no	Clause No	Clarification required by the applicants	Reply from BBMP
2	Tender Notification INVITATION FOR TENDER (IFT) – Fixed price-No variation-No escalation	The project to be excited is invited with completion period 24 months. Generally, for projects of above 18 months completion period, price variation and escalations applicable to compensate the variations in prices of construction materials, machinery, fuel, wages of workers, etc. request to adopt apply standard price variation escalation clauses.	The Bidder has to calculate the probable escalation price and participate in competitive bidding and Refer Section – 6, Clause No 1.1
3	Section 3 Clause No 1.10	Attach certificate from the Banker in the suggested Format	Banker's Certificate Format shall be uploaded in the kppp portal
4	Section-5 Condition of Contract under Special Conditions of Contract clause-65 Release of performance Security:	Request to release 100% after completion of DLP, and Maintenance period shall be compensated suitably to maintain the spans as paid by NHAI MORTH.etc..	Tender condition Prevails
5	Section - 6: Scope of work and Design Criteria clause 1.3 dd regarding – Removal Disposal	Kindly provide official Damping yards available with the leads.	Tender condition Prevails
6	Tender Drawing No : NEZPL DWG PRJ/204-4-1 to NEZPL DWG PRJ 204-4-4	C/c of expansion joint is mentioned in the drawings with large s m spans. It appears that stability of curvi-linear spans have not been examined. Please confirm.	The agencies have to design the same and get approval from concerned authorities also and proof consultants with justification.
7	Cl 1.3 (d), section 6: Scope of work and design criteria	Geotechnical Investigation Report please be furnished	shall be uploaded in the kppp portal

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Sl no	Clause No	Clarification required by the applicants	Reply from BBMP
8	Cl 1.3 (q) section 6: Scope of work and design criteia:- coordinate with KPWD, NHAI,etc.,	Since the tender is on Turnkey – Lump sum - Fixed Price - No Variation - No Escalation basis, kindly let us know the provision made in the tender estimate towards this item of work.	Refer clause No 1.3 (f) of the same section-6
9	Tender Drawings No.: NEZPL DWG PRJ 204-4-1 to NEZPL DWG PRJ 204-4-4 and Section-6 , cl 2.8.1.	Considering the minimum vertical clearance of 6.525m between rail top level and soffit of superstructure, we presume that the FRL can be reduced. Please clarifiy.	GAD has already been approved by SW Railways / K-Ride. Any revision in SPAN Levels shall be in consultation with South Western Railways and it shall be the responsibility of the successful bidder to obtain further approval for re-designs.
10	Cl. 1.3(r). SECTION 6: clause-4.0 Programme of Submission and Approval of Designs and Drawings	We presume that GAD for all ROB spans are approved by Railways. In case, the GADs are to be prepared and submitted to Railways for Approval by the successful tender after detailed surveys and Geotechnical investigations, then the time line of 5 to 10 weeks for the approval of same is grossly inadequate. It is our experience in other similar assignment / projects that the obtaining approval from Railways for such a non-conventional and complicated Elevated Rotary structure would take minimum of 1 year with all follow up from tenderer and also with complete support from client. Please clarify.	Tender condition Prevails In-principle approval for GAD is obtained from S W Railways / K-Ride, for speedy clearance from railways for structural design Execution. successful tenderer should follow the clause 1.3 (s) of section-6 before submission of design report to Railways.

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11	Section 6- Clause 2.8.1 Elevated Rotary Flyover and Pedestrian Underpass.	As per IRC:86, extra widening on curves having radius between 21 to 40 and 41 to 60m is 1.5m and 1.2m for two lane and 3m and 2.4 m for 4 lane road. Request you to clarify whether Elevated Rotary having radius between 32.5m (Inner radius) and 47.5m (outer radius) should be widened as per IRC 86? If yes, please specify the extra widening to be provided for the elevated rotary, if any and accordingly the adjoining approach spans would be modified.	The successful bidder agencies should submit the drawings as per IRC.
12	Section 6- Cl. 1.3(u), and 2.8.12	It is observed that the heights of crash barriers over viaducts /approaches are varying in tender drawings from drawing to drawing and in two different details within same drawing and similar is the case with hand rail over crash barrier which is observed in some sections and not found in some other sections. Similarly, the height of crash barrier over ROB portion and along the defence lands are varying and not in line with IRC :5-2015 requirements. As per IRC :5-2015, Fig. 2, the height of crash barrier is 1.1m above wearing course without railing and 1.550 for high containment Crash barrier without railing in Fig.3. Please clarify the details of crash barriers (with or without railing) to be adopted at ROB, Defence properties and other locations.	Crash barriers over Rotary/ROB/Viaduct/RE wall . Refer drawing No NEZPL/DWG/PRJ/204-4-1 to 4 and as per IRC.

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Sl no	Clause No	Clarification required by the applicants	Reply from BBMP
13	Section 6- Cl. 1.3(x).	Please confirm that the same compound wall as shown in the tender drawing is required to be constructed for private individuals who will partially lose their property?	Successful Bidders during execution of compound wall to be executed in consultation with BBMP.
14	Section 6- Cl. 1.3(y).	What is the capacity of Sewage Treatment Plant to be considered?	Capacity of Sewage Treatment Plant to be considered is 100KLD. Provision is made in the amount put to tender.
15	Section 6 – Clause 2.8	Not found. Request you to furnish drawing no. NEZPL/DWG/PRJ/204-5.	Shall be uploaded in the KPPP Portal
16	Section6- 2.8.1 & 2.8.4 (c) (ii)	As per IRC:86, design speed of 30 kmph cannot be achieved for a curve radius of 32.5m and with a camber of 2.5%. Please clarify? We presume that the design speed of all approaches shall be 40 kmph. Minimum horizontal curve radius is 70m for a design speed of 40 kmph and for 4% superelevation. Wherever the radius of curve is less than 70 m in viaduct and approaches, the same shall be improved to achieve minimum 70m radius along with required transition curves. Extra widening shall be provided as per IRC -86 on all approaches of elevated road and ROB for a design speed of 40 kmph and curve radius. Further, wherever extra widening is proposed, there will be additional land acquisition to the extent of extra widening along the curves and curve improvements. Please clarify.	IRC-65 -2017 is followed for design speed and radius of curvature for elevated rotary, exit, entry.
17	Section 6- Clause 2.8.2	We presume that PQC pavement is proposed on all solid ramps.	The concrete pavement is designed based on IRC SP 62-

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	(d)	However, the proposed pavement crust appears to be inadequate considering the long design life of approaches to flyover and expected type of traffic onto the proposed structures. Please clarify.	2014
18	Section 6- Cl. 2.8.3(d).	We presume it is obligatory to retain length of viaduct. Span shall be based on geotechnical investigation and as per site requirement. Please clarify.	Minimum length of mandatory span for railway crossing shall be followed as per conceptual drawings and may be decided by designer for viaduct section based on geotechnical investigation site requirement.
19	Section 6- Cl. 2.8.4	Please clarify on length to be covered by Open spans?	The successful bidders agency has to be submit the drawings.
20	2.8.8 Substructure. b. Protection to Pier, Page no 72	Kerb is shown adjacent to pier in Sec J-J in Drawing. No. NEZPL DWG PRJ 204-4-6 which is not in line with clause 2.8.8. Please clarify.	Clause 2.8.8 to be followed
21	2.10(a) Slip Roads, other Surface Level Roads , Culverts and Junction Improvements, Page -78	In order to achieve a taper of 1 in 15, the land acquisition would increase as the same is not available at most of the locations all along the at-grade roads. For example Kammanahalli end of approach where the approach is abruptly ending at the cross road and a taper of 1 in 15 would require additional land acquisition. Please clarify.	Successful bidders to prepare the detailed engineering drawings and to be got approved from railways for their portions, and employer before execution.
22	Section 6- Cl 2.17.9, & 4.0	We presume that GAD for all ROB spans are approved by Railways.	Tender condition prevails As the GAD is approved in

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		In case, the GADs are to be prepared and submitted to Railways for Approval by the successful tender after detailed surveys and Geotechnical surveys, then the time line of 5 to 10 weeks for the same is grossly in adequate. It is our experience in other similar assignment projects that the obtaining approval from Railways for such a non-conventional and complicated Elevated Rotary structure would take minimum of 1 year with all follow up from tenderer and client assistance. Please clarify.	principle, successful bidders should follow the clause 1.3 (r), (s), (t).
23	Section 6- Cl 4.0	Considering the approval of GAD of railways involved, the timelines proposed for the submission of designs and drawings are inadequate and to be modified. Revised time lines are proposed and attached as annexure -1 for consideration. Please confirm.	Tender condition prevails.
24	Construction Scheme Envisaged in the Tender	Please explain, the construction scheme envisaged in the tender while arriving at the estimated cost and tender construction time? Kindly explain the construction scheme and moving the fabricated girder to location considering the blocks available from Railway operation department. Request you to let us know how many casting fabrication yards and lead from Project site are considered in the estimates.	Estimated cost covers the cost of all the works as envisaged in the scope of works mentioned in the tender documents.

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25	2.17.10.	Total circumferential length is mentioned as 255m whereas the addition of 4 individual spans is 253.81m. Please clarify.	The circumferential length of the centre to centre of the rotary piers is 253.81m.
26	Drg. No. NEZPL DWG PRO 204-4-4	Width of at-grade road Carriageway shall be specified in all sections i.e. Sec C-C, D-D, E-E, B3-B3, F-F, B1-B1, B2 -B2 etc., The at-grade road cross sections along the existing road and proposed road widths shall be given in detail in all the approaches so as to assess the quantum of at-grade road works and submit most competitive price bid accordingly.	The estimated quantity for rebuilding the graded road is approximately 42,000 Sqm.
27	Drg. No. NEZPL DWG PRJ 204-4-6	Sec G-G and J-J - Height of crash barrier shall be specified. Further height of raised barrier with Galvalume Iron Trapezoidal sheet shall be specified in Sec J-J?	Refer clause No 1.3 (u) & 2.8.2 (e) of section-6
28	Drg. No. NEZPL DWG PRO 204-4-4	At Sec B1-B1 along Kammanahalli Road approach, the vertical height at proposed abutment location is less and hence required vertical clearance for the traffic movement is not available. Therefore, the traffic has to be diverted to the side slip road /service road where vertical clearance is available. Accordingly, land acquisition would increase in the viaduct portion between PK3 to PK5. The same would be applicable in all similar other locations also i.e. Land acquisition would increase at such locations.	The drawing referred is conceptual plan. Successful bidders to prepare the detailed engineering drawings and to be got approved from railways for their portions, and employer before execution.

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Sl no	Clause No	Clarification required by the applicants	Reply from BBMP
		Please clarify. 2) Minimum vertical clearance at abutment locations may be specified so as to adopt same at the time of preparing GAD for the proposed structures.	
29	Status of land acquisition	Status of land acquisition may please be provided along with timelines for the balance land acquisition if any.	Land acquisition is under process.
30	General	Additional Land requirement Right turning from properties at Banasawadi approach road end and adjoining road approach (near Ch:205): Due to one way movement and due to available VC at abutment locations, the access to the properties is not available at solid ramp portion and immediately after solid ramp portions and land acquisition would be required during execution stage. Please clarify.	The drawing referred is conceptual plan. Successful bidders to prepare the detailed engineering drawings and to be got approved from railways for their portions, and employer before execution.
31	AutoCad Drawings	Considering the less time available, request you to furnish available topographical survey drawing for the purpose of assessing the dismantling of existing structures, features, utility details, trees etc., and for the purpose of Preliminary Designs etc., so as to submit the most competitive bid.	Soft copy of the drawing is already uploaded, the time for submission of bid is further extended to facilitate for detailed inventory, review of preliminary design, survey investigation, and to submit the competitive bid.

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32	General - Obligatory Horizontal and vertical clearances	Provision for Road Crossings under elevated road approaches and Vertical and Horizontal clearances for every crossing shall be indicated in the drawings schedules.	The drawing referred is conceptual plan. Successful bidders to prepare the detailed engineering drawings and to be got approved from railways for their portions. and employer before execution.
33	General Points	a) Status of Land acquisition	Under process
		b) Status of Railway Approvals (Which will significantly impact the construction schedule	GAD approved by railways K-Ride in principle
		Geotechnical Report (even preliminary report) is not available which will have significant impact on the design and construction of the structure and on the cost. There is no indication of water table either which will significantly cost of foundations and underpasses	Shall be uploaded in the portal
34	Certificate of minimum 790 MT of structural steel approved used designed using in a single project for fabricating Steel Girders of Steel I Box Bowstring Girders in any State Central Government project in operation for work completed or On-going works during last 3 financial years should be submitted for qualification of minimum quantities of Structural steel The certificate should be duly issued by the competent authority not below the rank of Executive Engineer	Please consider 719MT structural steel work done in any one year during last 5 Financial year	Tender condition prevails
35	Detailed Design and Drawings Detailed Description of Work and Specifications of Materials and Items	For Tender purpose will submit design basis report details description of work and specification of material and items	Tender condition prevails

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		please confirm	
36	As this is a Turn Key lump sum No variation Fixed Price Contract for a Tendered amount of Rs352point 48 Crores including GST to be executed within the prescribed period of 24 months it is necessary that the department has to hand over all the parts of the required work front within the stipulations of the Conditions of Contract at the time of issue of Notice to proceed with the work	Please clarify whether all the land required for the work has been acquired in full or what percentage of land is still to be acquired and the targeted date for completion of land acquisition	Land acquisition is under process.
37	during the course of one of the meetings the Honourable Chief Minister expressed his anguish about calling for tenders without the prescribed one third grant for the work in the Budget and consequent repercussions	Please clarify whether the availability of funds of one third grants are taken care of for the present project to avoid future complications	Govt. approved the project for Tendering with budgetary allocation.
38	As this is a Turn Key Lump Sum Contract time is the essence of Contract and as such the department has to fulfil its reciprocal promise of timely release of payment for the works executed	We request that the RA Bills submitted for payment to be released within 30 days of the Bill submission	Refer section 5 of GCC clause 18 of F- Special condition of contract.
39	Relocation of Services and Tree Transplantation Works shall be the responsibility of the Contractor Further all the Utility and Service Lines such as Water Supply Underground Drainage Electrical Telephone Optical Fibre Cables	Kindly provide details of the utilities to be shifted as per DPR studies	Refer section 6 clause 1.3 (f) of Tender document
40	Dismantling of Existing ROB at IOC junction and Disposal of Earth / Debris of existing RCC and Masonry Structures PCC existing Road Pavements	Pls confirm whether clearance for dismantling of existing ROB has been already obtained from Railways	Railways K-Ride approved the GAD drawing based on the concept drawing for replacing the existing flyover.

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	RCC SSM Drainage Structures Tree Roots Culverts Medians Kerbs Traffic Islands Earth Retaining Structures Ducts Hoarding and Advertisement Boards and Appurtenant Structures etc. required for the Execution of the Work		
41	The Centre Line of the Elevated Rotary and its approaches ROB Piers of Flyovers Abutments RE Walls Surface Level Roads Slip Roads Corridor Electrical room for Railways Drainage Facilities and the Foundations	Request to modify to 21 days from the date of signing of Agreement	Tender condition prevails
42	Only Single Pier Type Structure shall be considered for Elevated Rotary Flyovers Pier Shape shall be aesthetically pleasing preferably elliptical circular ornamental Piers of Classical Design etc. In this regard the Decision of the Employer is final and binding	The Type of pier and Pier cap will be adopted as per the design requirement with due consideration to aesthetics	Detailed design and drawings should be approved by Railway K-Ride and Employer before execution as the case may be.
43	Geometry of Rotary	Circulatory carriage way as per IRC65-2017 shall be 15m hence total deck width at rotary shall be 16m Please confirm	Tender condition prevails refer reply to quarry no 11 above
44	Geometry of Rotary	Weaving width in rotary should be one traffic lane wider than the entry width Entry width at Banasawadi side arm is 15m 4 lane accordingly weaving width shall be 15 plus 3 point 5m Please confirm	Tender condition prevails
45	Geometry of Rotary	The proposed super structure depth of rotary is different for various span which may not be desirable aesthetically If uniform depth to be provided for all spans based on depth required for maximum span of 81point31 there	IRC-65 -2017 to be referred for detailed design.

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		will be cost implication please clarify	
46	The land acquisition plan no NEZPL DWG PRJ 204-5 also enclosed to understand the proposed right of way The successful tenderer shall follow the concept plan for profile design within the proposed right way shown in LA plan without changing the concept If there is any deviation in concept plan tenderer shall obtain prior approval from BBMP before commencement of design	Kindly provide the Current status of Right of way available with the Authority	Land Acquisition plan shall be uploaded in the portal .
46	Further Length of elevated rotary viaduct span has been fixed in consultation with sub-urban railway department K-Ride to minimize the interference of Piers with the proposed railway lane and to minimize the railway land at grade	PLs confirm whether General arrangement drawings over railway tracks future tracks are approved by the railways authority	Railways K-Ride authority have approved GAD in principle successful bidder may apply minor changes for geometrical improvement since the Elevated Rotary concept and GAD is already approved by the Railways K-Ride.
47	Pedestrian Underpass Typical Cross Section of PUP at IOC Junction Railway Crossing Below Rotary is enclosed in the Tender drawing	PLs confirm whether General arrangement drawing is approved by the railways authority	Railways K-Ride authority have approved GAD in principle.
48	The Structural Configuration for the Road Over Bridge and Approaches is shown in Tentative General Alignment Drawing no NEZPL DWG PRJ 204-4-5 to 6 The Design Criteria and Viaduct Requirements to be adopted for the	PLs confirm whether General arrangement drawing is approved by the railways authority	Railways K-Ride authority have approved GAD in principle.

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	Tenderers Proposal are furnished in the next Section		
49	Live Load The Elevated Rotary Flyovers shall be designed as per IRC 6 Latest Edition	The flyover will be designed for vll 70R and class A vehicles with appropriate impact factor only	Tender condition Prevails
50	RCC for Super Structure M45	As per IRC Minimum Grade of concrete is M30	Tender condition Prevails
51	The Soil strata at the location of construction of Elevated Rotary and Road over Bridge at LC No 136A is very hard and stiff with Non cohesive soil As could be seen from the geotechnical investigation indicated in the tender drawing the hard strata could be seen below the ground at a depth of 3-6m with N-value greater than 100	please provide Soil Report done during DPR Stage for our reference	Shall be uploaded in the kppp portal
52	Metal Casings with thickness not less than 5mm shall be used to support the unstable sides from the top of the Borehole to the Soft Rock Level	Casing requirement as per IRC 78	Tender condition Prevails
53	Low Strain Integrity Test shall be carried out for all the Piles in conformation to ASTM D 5882 from an Empanelled Consultant in the Ministry of Shipping Road Transport and Highways The Tenderer shall include the Cost of Conducting this Test in his Turn Key Lump Sum	We propose to carry out integrity test for 50percent of pile executed	Tender condition Prevails

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	Tender		
54	-	Please Provide tender drawings in autocad format	Soft copy of the drawings are already uploaded. the time for submission of bid is further extended to facilitate for detailed inventory, review of preliminary design, survey investigation, and to submit the competitive bid.
55	-	Please provide the traffic diversion plan as per DPR drawing for our reference	Refer Section-6 clause 1.3 (n)

Executive Engineer
RI-East Division, BBMP

Engineer-In-Chief
Bruhat Bengaluru Mahanagara Palike

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BANKER'S CERTIFICATE

This is to certify that M/s. …….. is a reputed company with a good financial standing. If the contract for this work, namely …… (name of the work) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. …… to meet the working capital requirements for executing the above contract.

Sd/-
Name of the Bank, Senior Bank Manger
Address: …….

Geo Technical Investigations for Foundation of Structure

Annexure-1: Shows the location of boreholes for the proposed construction site. The details are summarized below:

BH No.	Reference	Structure	Depth of explorations (m)	Water Table, m
At Rotary Location				
BH-1	Petrol Pump, IOC Junction Rotary	Proposed Rotary Location	16	Nil
BH-2	Inside existing loop to Kammanahalli		10.5	Nil
BH-3	Existing Flyover (Mukunda Theatre)		21.4	Nil
BH-4	Existing Ramp to Railway Station (Rotary Byyappanahalli)		16.0	Nil
BH-5	Existing Ramp to Railway Station		11.5	Nil
BH-6	Sir. M. Visvesvaraya Railway Station front side		23.5	Nil
At ROB Location				
BH-7	P0	Proposed ROB Location	6.5	Nil
BH-8	NP4		24.5	5.0 (Seepage)
BH-9	NP3		19.0	1.0 (Seepage)

Refer Annexure II for Bore logs.

Sub-Soil Stratification Description:

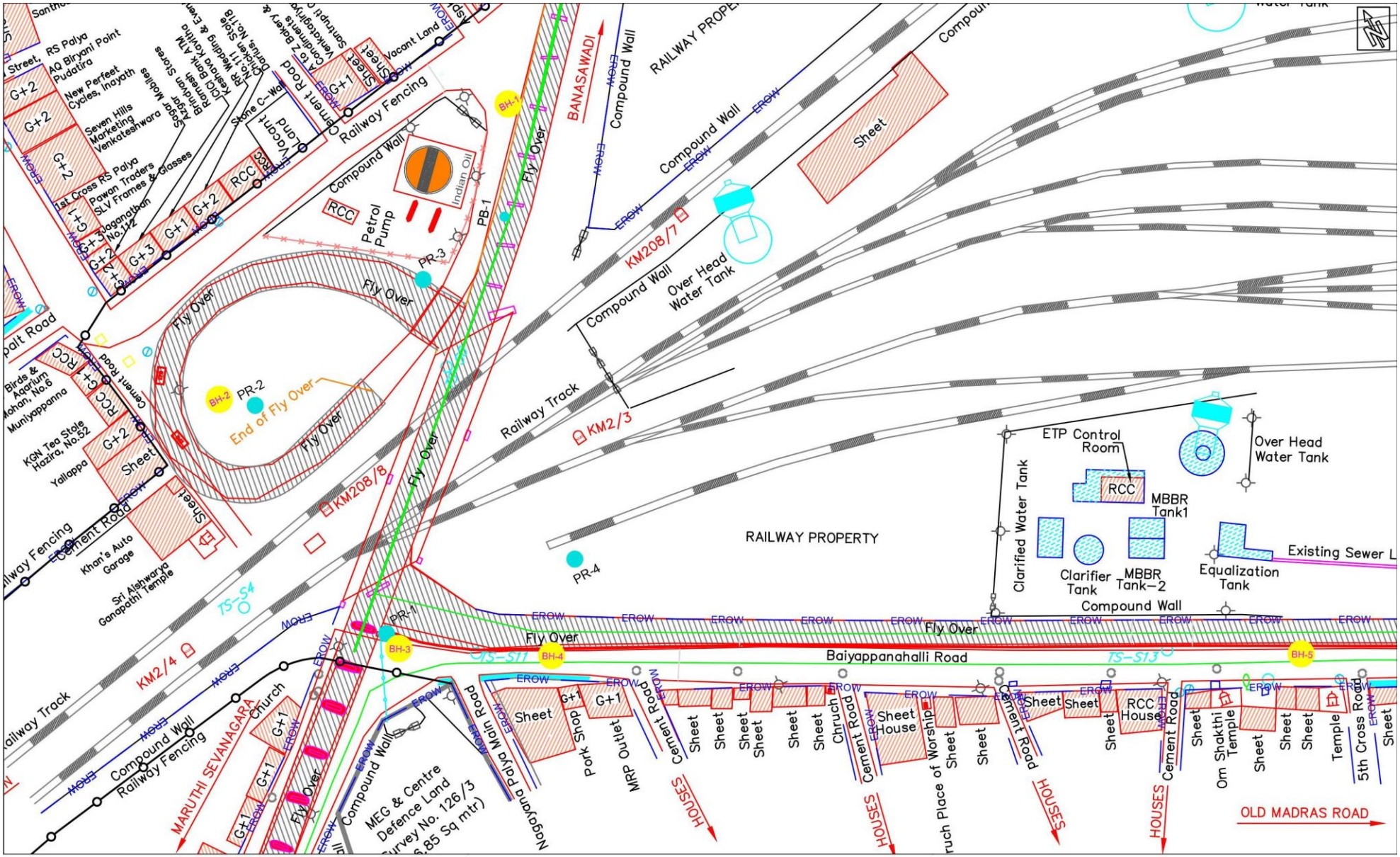
BH. No.	Reference	Explored Depth, m	Thickness of layer in sequence (m)			
			Layer – I Soil/CWR (N<100)	Layer – II CWR (N>100)	Layer III - MWR/HR	Remarks
At Rotary location						
BH-1	Petrol Pump, IOC Junction Rotary	16	0.0 to 4.5	4.5 to 13.5	13.5 to 16.0	HR
BH-2	Inside existing loop to Kammanahalli	10.5	0.0 to 4.5	4.5 to 10.5	--	--
BH-3	Existing Flyover (Mukunda Theatre)	21.4	0.0 to 3.0	3.0 to 20.4	20.4 to 21.4	HR
BH-4	Existing Ramp to Railway Station (Rotary Byyappanahalli)	16	0.0 to 4.5	4.5 to 15.0	15.0 to 16.0	HR
BH-5	Existing Ramp to Railway Station	11.5	0.0 to 4.5	4.5 to 10.0	10.0 to 11.5	HR
BH-6	Sir. M. Visvesvaraya Railway Station front side	23.5	0.0 to 9.0	9.0 to 23.0	23.0 to 24.5	SR/HR
At ROB Location						
BH-7	P0	6.5	0.0 to 1.5	1.5 to 4.5	4.5 to 6.5	HR
BH-8	NP 4	24.5	0.0 to 9.0	9.0 to 22.0	22.0 to 23.5	HR
BH-9	NP 3	19	0.0 to 12.0	12.0 to 16.5	16.5 to 19.0	HR

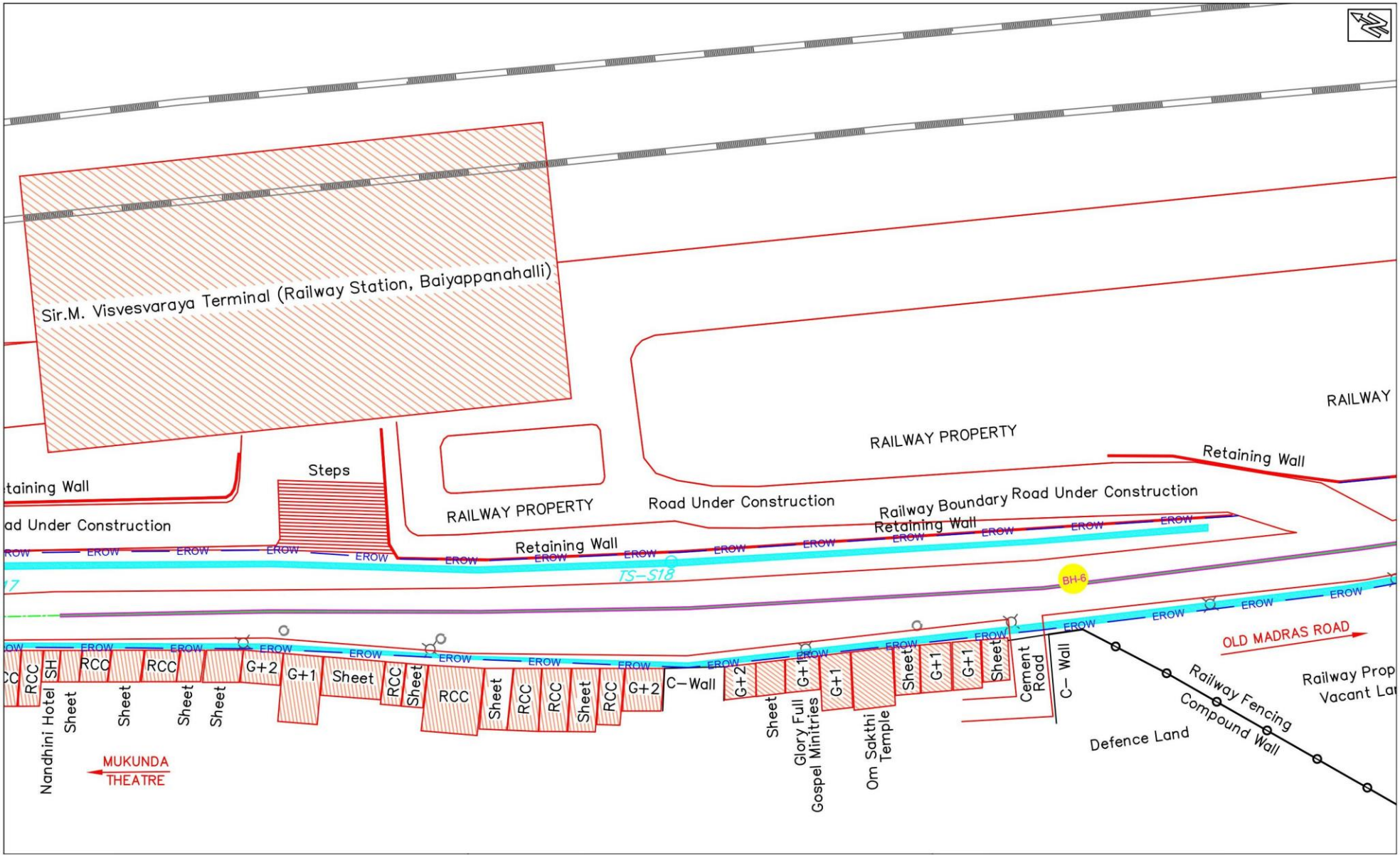
***EGL - Existing Ground Level, ROL - Rock Occurrence Level, SR - Soft Rock,**

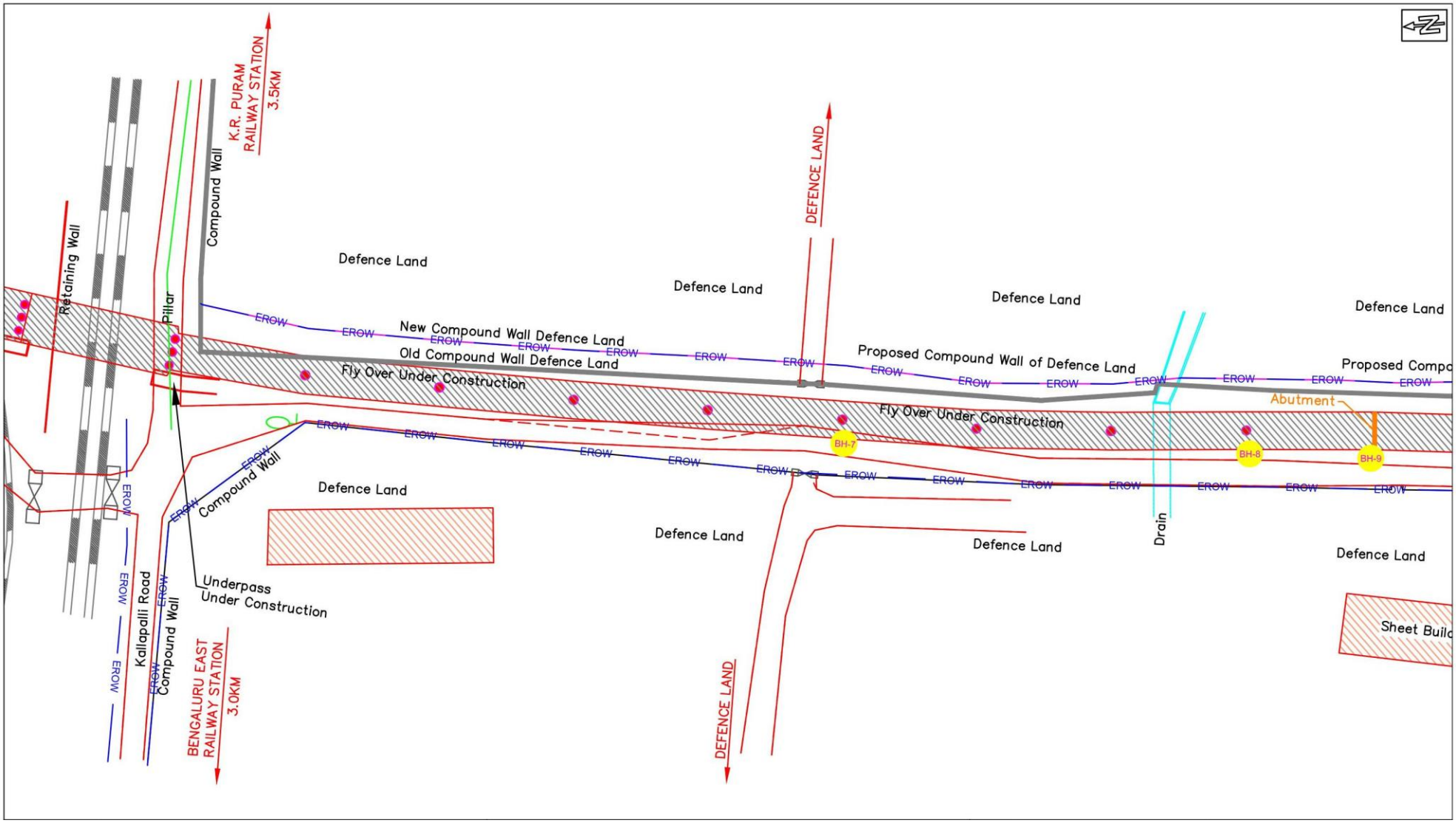
CWR - Completely Weathered Rock, HR - Hard Rock.

The data obtained from this geotechnical investigation and sampling is based on the site conditions prevailing at the time of subsurface exploration. Geo-technical results are based on data obtained from borehole investigations. Strata differences are likely to occur. These results are considered to arrive at the preliminary design and to assess the underlying ground conditions; depth and type of existing rock and depth of the proposed pile and this report should be considered as preliminary information.

Borehole Marking Drawings




Sir.M. Visvesvaraya Terminal (Railway Station, Baiyappanahalli)
RAILWAY
RAILWAY PROPERTY
Retaining Wall
taining Wall
Steps
RAILWAY PROPERTY
Road Under Construction
Railway Boundary
Road Under Construction
ad Under Construction
Retaining Wall
EROW
TS–S18
BH-6
OLD MADRAS ROAD
Railway Fencing
Compound Wall
Railway Prop
Vacant La
Defence Land
RCC
SH
Sheet
G+2
G+1
C–Wall
Nandhini Hotel
MUKUNDA
THEATRE
Glory Full
Gospel Minitries
Om Sakthi
Temple
Cement
Road
C– Wall


K.R. PURAM
RAILWAY STATION
3.5KM
Compound Wall
DEFENCE LAND
Retaining Wall
Pillar
Defence Land
Defence Land
Defence Land
Defence Land
EROW
New Compound Wall Defence Land
Old Compound Wall Defence Land
Fly Over Under Construction
Proposed Compound Wall of Defence Land
Proposed Compo
Abutment
Fly Over Under Construction
BH-7
BH-8
BH-9
Compound Wall
Defence Land
Defence Land
Defence Land
Drain
Defence Land
Underpass
Under Construction
Kallapalli Road
Compound Wall
BENGALURU EAST
RAILWAY STATION
3.0KM
DEFENCE LAND
Sheet Build

Annexure-II

BORE LOG SHEET										
Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing.**									**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**									**24-1-2022**
BH No:	**1**		**Ground Water Level : Not Encountered**				**Termination Depth:**			**16.0m**
Location	**Easting : 786053.872 Northing : 1439143.541**						**Page No.**			**1**
Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, Number of blows recorded**			**N value=N2+N3**	**Core Recovery, %**	**RQD %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N1	**N2**	**N3**				
Brownish Silty Sand with Gravel	0.0									
	0.5		DS							
Grayish Brown Silty Sand	1.5		SPT DS	14	16	17	33			
	3.0		SPT DS	10	13	15	28			
	4.5		SPT DS	13	18	22	40			
Whitish Gray Silty Sand	6.0		SPT DS	55B/7cm	R		>100			Refusal Strata
Whitish Brown SDR	7.5		SPT DS	50B/1cm	R		>100			
	9.0		SPT DS	50B/1cm	R		>100			
	10.5		SPT DS	50B/1cm	R		>100			
	12.0		SPT DS	50B/1cm	R		>100			
	13.5		SPT DS	50B/1cm	R		>100			
Whitish Gray HR	15.0		CR					47	47	
	16.0		CR					33	33	

Note :

Bore hole was terminated at 16.0m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**		**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**		**25-1-2022**
BH No:	**2**	**Ground Water Level : Not Encountered**	**Termination Depth: 10.5m**
Location	**Easting : 785965.878 Northing : 1439116.082**	**Page No.**	**2**

Description of Sub-soil stratum	Depth (m)	Legend	Sample	SPT TEST, Number of blows recorded			N value=N2+N3	Core Recovery, %	RQD %	Remarks
				1st 15cm	2nd 15cm	3rd 15cm				
				N1	N2	N3				
Filled Up	0.0									
	0.5		DS							
Brownish to whitish gray silty Sand	1.5		SPT DS	6	10	12	22			
	3.0		SPT DS	10	13	18	31			
Whitish gray silty Sand with gravel	4.5		SPT DS	14	19	35	54			Refusal Strata
Whitish Brown SDR	6.0		SPT DS	45	50B/15cm	R	>100			
	7.5		SPT DS	50B/1cm	R		>100			
	9.0		SPT DS	50B/1cm	R		>100			
	10.5		SPT	50B/1cm	R		>100			

Note :

Bore hole was terminated at 10.5m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**		**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**		**27-1-2022**
BH No:	**3**	**Ground Water Level : Not Encountered**	**Termination Depth: 21.4m**
Location	**Easting : 785974.798 Northing : 1439048.155**		**Page No. 3**

Description of Sub-soil stratum	Depth (m)	Legend	Sample	SPT TEST, Number of blows recorded			N value=N2+N3	Core Recovery, %	RQD %	Remarks
				1st 15cm	2nd 15cm	3rd 15cm				
				N1	N2	N3				
Reddish yellow silty Sand with gravel	0.0									
	0.5		DS							
Grayish silty Sand	1.5		SPT DS	3	5	8	13			
	3.0		SPT DS	6	8	11	19			
Grayish to brownish yellow silty Sand	4.5		SPT DS	24	50B/5CM	R	>100			
	6.0		SPT DS	27	50B/6CM	R	>100			
Grayish yellow silty Sand	7.5		SPT DS	29	50B/8CM	R	>100			
Whitesh Yellow Silty Sand	9.0		SPT DS	33	50B/0CM	R	>100			
Grayish to brownish white silty Sand	10.5		SPT DS	50B/10cm	R		>100			
Grayish White CWR	12.0		SPT DS	50B/9cm	R		>100			
	13.5		SPT DS	50B/0cm	R		>100			
Grayish Brown CWR	15.0		SPT DS	50B/0cm	R		>100			
Brownish white CWR	16.5		SPT DS	50B/0cm	R		>100			
	18.0		SPT DS	50B/0cm	R		>100			
	19.5		SPT DS	50B/0cm	R		>100			
	20.4									
Brownish white HR	21.4		CR					100	100	

Note :

Bore hole was terminated at 21.4m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**									**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**									**30-1-2022**
BH No:	**4**		**Ground Water Level : Not Encountered**				**Termination Depth:**			**16.0m**
Location	**Easting : 786004.065 Northing : 1439030.565**						**Page No.**			**4**

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, Number of blows recorded**			**N value=N2+N3**	**Core Recovery, %**	**RQD %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N1	**N2**	**N3**				
Filled Up	0.0									
	0.5		DS							
Yellowish to brownish gray silty Sand	1.5		SPT DS	9	10	12	22			
	3.0		SPT DS	11	13	15	28			
Grayish yellow silty Sand	4.5		SPT DS	15	16	19	35			
Grayish brown CWR	6.0		SPT DS	50B/6cm	R		>100			Refusal Strata
Brownish white SDR	7.5		SPT DS	50B/1cm	R		>100			
	9.0		SPT DS	50B/1cm	R		>100			
	10.5		SPT DS	50B/1cm	R		>100			
	12.0		SPT DS	50B/1cm	R		>100			
	13.5		SPT DS	50B/1cm	R		>100			
	15.0		SPT	50B/1cm	R		>100			
Whitish Gray HR	16.0		CR					40	40	

Note :

Bore hole was terminated at 16.0m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**									**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**									**31-1-2022**
BH No:	**5**		**Ground Water Level : Not Encountered**				**Termination Depth:**			**11.5m**
Location	**Easting : 786151.479 Northing : 1438951.552**						**Page No.**			**5**
Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, Number of blows recorded**			**N value=N2+N3**	**Core Recovery, %**	**RQD %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N1	**N2**	**N3**				
Brownish red sandy Silt	0.0									
	0.5		DS							
Brownish gray silty Sand	1.5		SPT DS	15	17	20	37			
	3.0		SPT DS	20	22	25	47			
Whitish to brownish gray silty Sand with gravel	4.5		SPT DS	25	25	25	50			Refusal Strata
Whitish brown SDR	6.0		SPT DS	35	50B/15cm	R	>100			
	7.5		SPT DS	50B/1cm	R		>100			
	9.0		SPT DS	50B/1cm	R		>100			
	10.0		SPT DS	50B/10cm	R		>100			
Whitish to brownish gray HR	11.5		CR					27	27	

Note :

Bore hole was terminated at 11.5m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**	**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**	**2-2-2022**
BH No:	**6** — **Ground Water Level : Not Encountered** — **Termination Depth:**	**23.5m**
Location	**Easting : 786494.753 Northing : 1438423.904** — **Page No.**	**6**

Description of Sub-soil stratum	Depth (m)	Legend	Sample	SPT TEST, Number of blows recorded			N value=N2+N3	Core Recovery, %	RQD %	Remarks
				1st 15cm	2nd 15cm	3rd 15cm				
				N1	N2	N3				
Brownish silty Sand with gravel	0.0									
	0.5		DS							
	1.5		SPT DS	3	4	6	10			
Grayish Brown Silty Sand	3.0		SPT DS	50B/14cm	R		>100			
	4.5		SPT DS	25	30	34	64			
	6.0		SPT DS	30	35	38	73			
Grayish to whitish yellow silty Sand	7.5		SPT DS	10	13	15	28			
	9.0		SPT DS	15	16	18	34			
Grayish yellow CWR	10.5		SPT DS	35	50B/0cm	R	>100	40	40	
Grayish white CWR	12.0		SPT DS	48	50B/5cm	R	>100	40	40	
Grayish Yellow CWR	13.5		SPT DS	25	32	36	68			
	15.0		SPT DS	30	34	38	72			
	16.5		SPT DS	31	37	40	77			
Grayish Brown CWR	18.0		SPT DS	50B/0cm	R		>100			
	19.5		SPT DS	50B/0cm	R		>100			
	21.0		SPT DS	50B/10cm	R		>100			
	22.0									
Blackish White SR	22.5		CR					34	Nil	
Blackish White HR	23.5		CR					95	95	

Note :

Bore hole was terminated at 23.5m depth below existing ground level

SPT - Standard penetration test — Refusal means SPT N>50 — R= Rebound — HR:Hard Rock

DS - Undisturbed sample — B=No. of blows — SR: Soft Rock — CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**								**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**								**4-2-2022**
BH No:	**7**		**Ground Water Level : Not Encountered**				**Termination Depth:**		**6.5m**
Location	**Easting : 786737.068 Northing : 1437538.324**						**Page No.**		**7**

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, Number of blows recorded**			**N value=N2+N3**	**Core Recovery, %**	**RQD %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N1	**N2**	**N3**				
Brownish red sandy Silt	0.0									
	0.5		DS							
	1.5		SPT DS	8	13	16	29			
	3.0		SPT DS	50B/5cm	R		>100			Refusal Strata
Brownish white SDR	4.5		SPT DS	50B/5cm	R		>100			
Whitish gray HR	5.0									
	6.5		CR					52	39	

Note :

Bore hole was terminated at 6.5m depth below existing ground level

SPT - Standard penetration test | Refusal means SPT N>50 | R= Rebound | HR:Hard Rock

DS - Undisturbed sample | B=No. of blows | SR: Soft Rock | CWR: completely weathered rock

SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**	**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**	**5-2-2022**
BH No:	**8** — **Ground Water Level : Not Encountered** — **Termination Depth:**	**24.5m**
Location	**Easting : 786726.910 Northing : 1437447.013** — **Page No.**	**8**

Description of Sub-soil stratum	Depth (m)	Legend	Sample	SPT TEST, Number of blows recorded			N value=N2+N3	Core Recovery, %	RQD %	Remarks
				1st 15cm	2nd 15cm	3rd 15cm				
				N1	N2	N3				
Brownish silty Sand	0.0									
	0.5		DS							
	1.5		SPT DS	8	10	13	23			
Grayish yellow silty Sand with gravel	3.0		SPT DS	20	25	36	61			
	4.5		SPT DS	21	24	40	64			
Whitish brown silty Sand with gravel	6.0		SPT DS	50B/10cm	R		>100			
Yellowish gray sandy Silt	7.5		SPT DS	11	13	20	33			
	9.0		SPT DS	10 50B/10cm	15	21	36			
Brownish white CWR	10.5		SPT DS	50B/1cm	R		>100			Refusal Strata
	12.0		SPT DS	50B/8cm	R		>100			
	13.5		SPT DS	50B/2cm	R		>100			
	15.0		SPT DS	50B/0cm	R		>100			
	16.5		SPT DS	50B/0cm	R		>100			
	18.0		SPT DS	50B/0cm	R		>100			
	19.5		SPT DS	50B/0cm	R		>100			
	21.0		SPT DS	50B/0cm	R		>100			
	22.5		SPT DS	50B/0cm	R		>100			
	23.0									
Blackish to brownish white SR	23.5		CR					76	66	
Grayish to blackish white HR	24.5		CR					69	69	

Note :
Bore hole was terminated at 24.5m depth below existing ground level

SPT - Standard penetration test — Refusal means SPT N>50 — R= Rebound — HR:Hard Rock
DS - Undisturbed sample — B=No. of blows — SR: Soft Rock — CWR: completely weathered rock
SDR: Soft disintegrated rock

BORE LOG SHEET

Project:	**Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing**	**Period of Field Investigation**
Client:	**Office of the Executive Engineer, Road infrastructure, East Division, # 208, 2nd Floor, Annexe-3 Building, N.R. Square, Bengaluru - 560002.**	**7-2-2022**
BH No:	**9** — **Ground Water Level : Not Encountered** — **Termination Depth:**	**19.0m**
Location	**Easting : 786723.584 Northing : 1437419.807** — **Page No.**	**9**

Description of Sub-soil stratum	Depth (m)	Legend	Sample	SPT TEST, Number of blows recorded			N value=N2+N3	Core Recovery, %	RQD %	Remarks
				1st 15cm	2nd 15cm	3rd 15cm				
				N1	N2	N3				
Filled Up	0.0									
	0.5		DS							
Grayish brown sandy Silt	1.5		SPT DS	6	8	10	18			
	3.0		SPT DS	10	15	17	32			
	4.5		SPT DS	9	16	19	35			
	6.0		SPT DS	10	21	25	46			
Grayish brown silty sand with gravel	7.5		SPT DS	16	33	38	71			
	9.0		SPT DS	16	20	20	40			
	10.5		SPT DS	15	19	24	43			
	12.0		SPT DS	13	10	21	31			
Grayish brown CWR	13.5		SPT DS	50B/10cm	R		>100			
	15.0		SPT DS	50B/0cm	R		>100			
Brownish white CWR	16.5		SPT DS	50B/0cm	R		>100			
Brownish white Hard Rock	18.0		CR					46	46	
	19.0		CR					49	34	

Note :

Bore hole was terminated at 19.0m depth below existing ground level

SPT - Standard penetration test — Refusal means SPT N>50 — R= Rebound — HR:Hard Rock

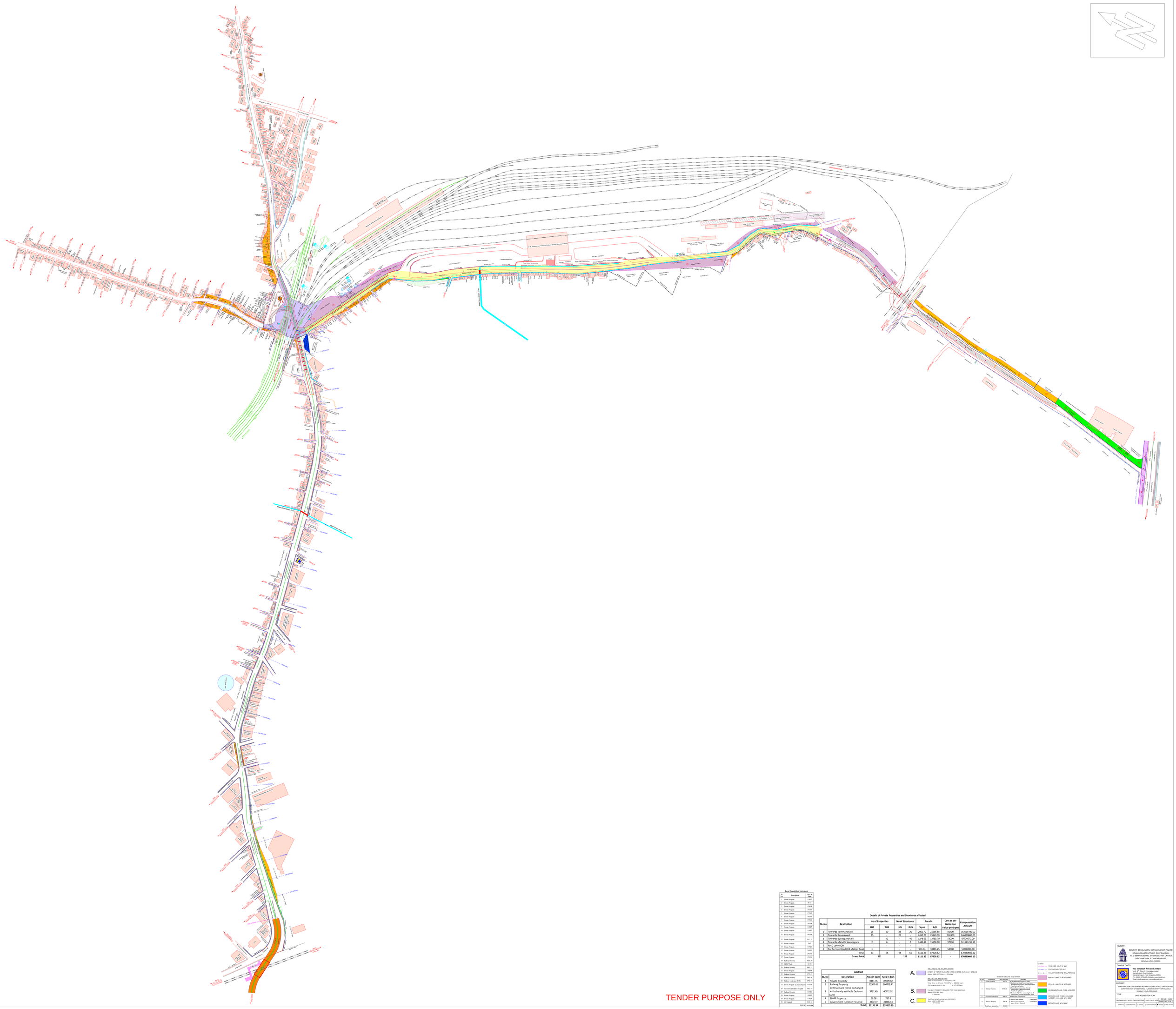
DS - Undisturbed sample — B=No. of blows — SR: Soft Rock — CWR: completely weathered rock

SDR: Soft disintegrated rock

LABORATORY TEST REPORT ON SOIL SAMPLES — **ANNEXURE - III**

Project: Construction of Elevated Rotary Flyover at IOC Junction and construction of additional 2 lane ROB at Byyappanahalli Railway Level Crossing — **Date of Test: 24.02.2022**

Borehole No	Sample Type	Sample No.	Depth (m)	Grain Size Distribution (%)					Atterberg Limits (%)			Free Swell Index (%)	IS Classification (IS:1498-1970)	Natural Moisture Content (%)	Bulk Density (gm/cc)*	Specific Gravity*	Shear Parameters		Description of Soil Strata
				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Liquid Limit	Plastic Limit	Plasticity Index						Cohesion (kN/m^2)	Angle of Internal Friction (deg.)	
1	SPT	354/1	1.5	1	9.6	28.8	13.8	46.8	---	---	---	---	---	8.3	---	---	---	---	Silty Sand
	SPT	354/2	3	0	2.9	32.1	16.1	48.9	---	---	---	---	---	5.9	---	---	---	---	Silty Sand
	SPT	354/3	4.5	1.9	4.7	42.3	14.1	37	---	---	---	---	---	9.1	---	---	---	---	Silty Sand
	SPT	354/4	7.5	0.1	5.9	84.2	9.1	0.7	---	---	---	---	---	7.6	---	---	---	---	Sandy Soil
	SPT	354/5	10.5	0	4.1	81.8	12.9	1.2	---	---	---	---	---	11.3	---	---	---	---	Sandy Soil
	SPT	354/6	13.5	0	1.8	87.9	10.3	0	---	---	---	---	---	10.6	---	---	---	---	Sandy Soil
2	SPT	354/12	1.5	2.6	7.9	33.1	13.2	43.2	---	---	---	---	---	14	---	---	---	---	Silty Sand
	SPT	354/13	3	0.1	3.1	34.6	17.1	45.1	---	---	---	---	---	7.6	---	---	---	---	Silty Sand
	SPT	354/14	4.5	1.4	7.1	39.2	14.3	38	36.6	---	NP	---	SM-MI	9.7	---	---	---	---	Silty Sand
	SPT	354/15	7.5	0	23.8	67	7.2	2	---	---	---	---	---	6.7	---	---	---	---	Sandy Soil
	SPT	354/16	10.5	0.5	0.8	23.4	29.9	45.4	---	---	---	---	---	12.9	---	---	---	---	Silty Sand
4	SPT	354/7	1.5	0.4	2.5	28.1	27.4	41.6	33.7	18	15.7	---	SM-MI	11.9	---	---	---	---	Silty Sand
	SPT	354/8	4.5	0	0.8	26.4	26.8	46	---	---	---	---	---	9.8	---	---	---	---	Silty Sand
	SPT	354/9	7.5	0.2	3.7	81.6	14.1	0.4	---	---	---	---	---	9.4	---	---	---	---	Sandy Soil
	SPT	354/10	10.5	0.2	3.3	79.5	15.4	1.6	---	---	---	---	---	12.8	---	---	---	---	Sandy Soil
	SPT	354/11	15	0	21.7	67.9	9.6	0.8	---	---	---	---	---	10.9	---	---	---	---	Sandy Soil
5	SPT	354/17	1.5	0	2.2	35.7	16.7	45.4	---	---	---	---	---	14.2	---	---	---	---	Silty Sand
	SPT	354/18	3	0	1.5	38.7	18.2	41.6	---	---	---	---	---	5.2	---	---	---	---	Silty Sand
	SPT	354/19	4.5	1.6	3.3	35.2	16	43.9	36	---	NP	---	SM-MI	8.6	---	---	---	---	Silty Sand
	SPT	354/20	7.5	0.4	16.8	80.1	2.3	0.4	---	---	---	---	---	12.7	---	---	---	---	Sandy Soil
	SPT	354/21	10	0	14.4	76	8.6	1	---	---	---	---	---	7.6	---	---	---	---	Sandy Soil
7	SPT	354/22	1.5	2.6	3.1	22.8	22.9	48.6	30.7	18	12.7	---	SM-MI	9	---	---	---	---	Silty Sand
	SPT	354/23	3	16.6	19.2	34.2	15.1	14.9	---	---	---	---	---	6.3	---	---	---	---	Silty Sand
	SPT	354/24	4.5	0	5.9	29.9	22.9	41.3	---	---	---	---	---	3.4	---	---	---	---	Silty Sand


Proposed Railway Track Alignment
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